Outcomes for Hong Kong Women Following Vaginal Mesh Repair Surgery for Pelvic Organ Prolapse

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Objective: To assess outcomes for pelvic organ prolapse and operative complications in women having vaginal mesh repair at a tertiary referral centre in Hong Kong.
Methods: A retrospective study design was used to collect both preoperative and postoperative data including the Pelvic Organ Prolapse–Quantification (POP-Q) score and complication rates. The primary outcome was improvement in POP-Q score. Secondary outcomes included perioperative and postoperative complications.
Results: A total of 65 women had vaginal mesh repair completed during the period of interest (1 January 2005 to 31 December 2012). In all, 34 women had total vaginal mesh repair while 24 and seven patients had anterior vaginal mesh repair and posterior vaginal mesh repair, respectively. One patient had anterior vaginal mesh repair and cervical amputation. There was significant elevation of the prolapsed part in both the anterior and posterior mesh repair groups. The 26 women in the total vaginal mesh repair group had significant elevation of the anterior and posterior vaginal wall and cervix. There was good preservation of vaginal length and no significant lengthening of the perineal body. Four (7.4%) patients were found to have mesh erosion. Three of the patients were asymptomatic and managed conservatively. One patient required partial excision of the mesh. There was one case of buttock abscess. No reported bowel or bladder injury was reported.
Conclusions: The study showed significant improvements on the POP-Q score in the corresponding compartment of the vaginal mesh repairs postoperatively.
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Introduction

Pelvic organ prolapse (POP) is a common clinical condition affecting parous women as they age. The prevalence of POP in the United States has been reported as up to 40%[1]. A territory-wide audit in Hong Kong demonstrated that the prevalence of POP has been consistently increasing over the last decade[2]. Pelvic organ prolapse causes symptoms such as vaginal bleeding, dragging discomfort, vaginal ulcers, and infection. In severe cases, patients may even present with complications such as acute urinary retention, hydronephrosis, and recurrent urinary tract infection[3]. These complications may be associated with an adverse effect on quality of life. Use of a vaginal pessary as conservative management was adopted by more than 85% of gynaecologists as initial treatment of POP[4]. However, use of a vaginal pessary is not the definitive treatment and complications including vaginal discharge, vaginal ulcer, discomfort, and abstinence from sexual activity are commonly reported[5]. Many patients may therefore prefer definitive surgical treatment. However, the quoted recurrence rate is up to 30% to 40% for traditional pelvic floor reconstruction surgery[6,7]. This rate is even higher in obese women with POP[8].

The concept of using polypropylene mesh for pelvic floor reconstruction aimed at reducing recurrence by reforming the defective pelvic floor with the new material[9]. It has been reported that vaginal mesh repair surgery produces better results in recurrent prolapse or for women with uterine procidentia when compared with traditional pelvic floor reconstruction surgery[9].

The history of vaginal mesh repair for POP began with abdominal sacrocolpopexy followed by laparoscopic sacrocolpopexy. However, the recurrence rate was high and

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was reported as up to 17.8% in a Swiss study[10]. Vaginal mesh repair has been used clinically since 2004[11]. The mesh is introduced via a specially designed trocar system, through a few small incisions. According to a Cochrane review, the mesh exposure rate is around 10% post-surgery[12]. Other commonly encountered complications included bladder or rectal perforation intra-operatively[9].

This study aimed to compare preoperative and postoperative POP-Q scores and to assess perioperative complications in local Chinese women having vaginal mesh repair for POP from 2005 to 2012, in a tertiary referral centre in Hong Kong.

Methods

This study was designed as a retrospective study. Information was retrieved from the Urogynaecology Team, Queen Elizabeth Hospital, Hong Kong, for all patients having vaginal mesh repair as treatment for POP in the period from 1 January 2005 to 31 December 2012. Demographic data including age, parity, number of vaginal deliveries, weight of heaviest baby delivered vaginally, and a history of POP surgery were retrieved and analysed. The results of preoperative urodynamic study performed for existing urinary symptoms were also reviewed. Operation details including types of procedure, duration of operation, mean blood loss, perioperative complications (bladder and bowel perforation, vaginal haematoma, deep vein thrombosis, buttock abscess, urinary tract infection, and mesh erosion) were all retrieved and analysed. Quantification of the POP outcome measurements was based on clinical assessment using the International Continence Society Pelvic Organ Prolapse–Quantification (POP-Q) scoring system[13].

All cases were recruited from the Urogynaecology Clinic, Department of Obstetrics and Gynaecology, Queen Elizabeth Hospital, Hong Kong. All women presented with symptoms of POP and were offered the following surgical options: vaginal mesh / sacrocolpopexy / sacrospinous fixation or traditional pelvic floor repair, with or without hysterectomy. All patients gave signed written consent before vaginal mesh surgery. Urodynamic studies were performed for women who complained of lower urinary tract symptoms, such as urgency, frequency, and urinary incontinence. If a diagnosis of urodynamic stress incontinence was made, the option of concomitant transobturator tension-free vaginal tape (TVT-O) was discussed and performed at the same time, if the patient gave consent.

Preoperatively, bowel preparation was given on the day before vaginal mesh repair. Preoperative vaginal examination was performed to assess the severity of POP using the POP-Q scoring system. If the patient had only anterior or posterior compartment prolapse, then only anterior or posterior mesh repair was completed. If the prolapse affected both compartments, total vaginal mesh repair surgery was performed. There were three types of mesh kit used in 65 women, namely GYNECARE PROLIFT (Ethicon, US) in 37 cases, Apogee / Perigee (AMS, US) in nine cases, and DynaMesh (FEG Textiltechnik Forschungs- und Entwicklungsgesellschoft mbH, Germany) in 19 cases. All operations were performed by an experienced urogynaecology subspecialist or a urogynaecology trainee under supervision. All procedures were completed according to the original technique reported[14].

A single dose of prophylactic antibiotics was given to all women preoperatively. Further intravenous and oral antibiotics were given postoperatively. Patients were discharged after bowel opening and passing urine without problem.

After discharge from hospital, all patients were assessed at 1 year post-surgery according to the follow-up protocol of this study. This included assessment on the POP-Q scoring system by vaginal examination, and assessment of peri- and post-operative complications by questionnaire. Details of the operation record were also collected for this study from the patient's medical record, with informed consent obtained.

The primary outcome measures of this study were improvement of POP-Q score and POP-Q staging of prolapse at 1 year post-surgery. Secondary outcome measurements included duration of operation, mean blood loss, bladder and bowel perforation, buttock abscess, urinary tract infection, and mesh erosion.

All collected data were grouped into tables accordingly. Statistical analyses were performed using the Statistical Package for the Social Sciences (Windows version 15.0; SPSS Inc, Chicago [IL], US). The preoperative and 1-year follow-up POP-Q scores were compared using the Student's *t* test and a p value of <0.05 was considered statistically significant. This study was approved by the Kowloon Central Cluster / Kowloon East Cluster Research Ethics Committee of the Hospital Authority (Reference No.: KC/KE-13-0614/ER-1).

Results

There were 65 women who had vaginal mesh repair

completed between 1 January 2005 and 31 December 2012. Their mean age (± standard deviation) was 65 ± 11 years and their mean duration of delay (i.e. from POP symptoms to first medical attendance) was 5 ± 4 years. In all, 26 (40%) women had a trial of a vaginal ring pessary as conservative treatment before the surgical intervention; 18 (28%) women had utero-vaginal prolapse. The mean parity was 3.6 ± 1.7 and the mean number of vaginal deliveries was 3.6 ± 1.7. The mean weight of baby delivered vaginally was 3.4 ± 0.4 kg. In addition, seven (11%) of the women had previous POP surgery.

Overall, 64 women had urodynamic studies performed preoperatively; among these, 40 (63%) had normal findings and 24 (38%) had a diagnosis of urodynamic stress incontinence. Of these 24 women, 22 (92%) had concomitant TVT-O completed during surgery.

All women had preoperative prolapse assessment by POP-Q score. The results are listed in Table 1. If the reported score was positive, it indicated the leading point of prolapse was out of the vaginal hymen and a negative value indicated the contrary.

Details on the types and number of operations performed are shown in Table 2. In all, 34 (52%) women had total vaginal mesh repair performed; among these, 23 (68%) and 11 (32%) women presented with vault and utero-vaginal prolapse, respectively. In addition to vaginal mesh repair, one woman presented with anterior compartment prolapse and a long cervix (4 cm) and she underwent anterior mesh repair and cervical amputation.

Table 1. Preoperative Pelvic Organ Prolapse–Quantification scores at different points/landmarks for measurement

Point/landmark	Frequency	Mean ± standard deviation score	Range
Aa	65	0.4 ± 2.0	-3 to 3
Ba	65	0.9 ± 2.9	-3 to 3
C	65	-1.3 ± 4.7	-8 to 10
gh	65	5.4 ± 0.8	4-6
pb	65	2.1 ± 0.4	1-3
tvl	65	8.2 ± 1.1	6-10
Ap	65	-1.3 ± 1.9	-3 to 3
Bp	65	-0.9 ± 2.9	-3 to 3
D	18	-2.9 ± 4.9	-8 to 8

Abbreviations: Aa, Ba = anterior compartment; Ap, Bp: posterior compartment; C = middle compartment; D = posterior vaginal fornix; gh = genital hiatus; pb = perineal body length; tvl = total vaginal length

Table 2. Details of surgery performed for all patients who underwent vaginal mesh repair surgery

	Overall (n = 65)	Vault prolapse (n = 47)	Utero-vaginal prolapse (n = 18)	
			Mesh-only group ± TVT-O (n = 11)	Mesh + vaginal hysterectomy group ± TVT-O (n = 7)
Total (i.e. anterior + posterior) vaginal mesh repair	34	23	6	5
Anterior mesh only	24	19	3	2
Posterior mesh only	7	5	2	0
Concomitant continence surgery	19	17	2	0
Mean ± SD operating time (mins)	88.9 ± 33.3	80.4 ± 26.1	89.7 ± 32.8	146.3 ± 23.3
Mean ± SD blood loss (ml)	221.5 ± 225.3	183.1 ± 229.5	125.0 ± 82.2	460.0 ± 181.7
Mean ± SD hospital stay (days)	6.3 ± 2.2	6.5 ± 2.4	5.6 ± 1.3	6.7 ± 1.4

Abbreviations: SD = standard deviation; TVT-O = transobturator tension-free vaginal tape

The mean operating time was similar for vault prolapse and utero-vaginal prolapse (80.4 mins vs. 89.7 mins). For concomitant vaginal hysterectomy and mesh repair, the mean operative time was 146.3 minutes, indicating additional time needed for vaginal hysterectomy. The overall mean blood loss was 221.5 ml, with higher mean blood loss for concomitant vaginal hysterectomy and mesh repair (460.0 ml). The overall mean hospital stay was 6.3 days.

Details of intra-operative and immediate postoperative complications are shown in Table 3. There were no reported incidences of bowel or bladder injury, or postoperative urinary tract infection. However, one woman had a buttock abscess that required incision and drainage. The mesh implant was left in situ and the infection was resolved after drainage and antibiotics. The patient had no further complications afterwards.

Of the 65 women, four (7.4%) were found to have mesh erosion at 1-year follow-up. Three were asymptomatic and adopted conservative management. One woman presented with on-and-off vaginal spotting and so partial excision of the vaginal mesh (3 x 2 cm) was performed. There was no case of postoperative chronic pelvic pain at 1-year follow-up.

Details of the pre- and post-operative POP-Q score according to the type of vaginal mesh repair (anterior, posterior, or total) are listed in Table 4. The comparison of POP-Q scoring was stratified into the respective type of surgeries performed with data from 54 women (21 with anterior, 7 with posterior, and 26 with total vaginal mesh repair). The remaining cases had undergone surgery within the previous year.

For the anterior vaginal mesh repair group, there were significant changes in points Aa ($p<0.001$), Ba ($p<0.001$), and C ($p=0.001$). This reflected that the anterior mesh repair was successfully targeted at correction of the anatomical defect and addressed the corresponding POP region. For the seven women who had posterior vaginal mesh repair performed, the changes at point Ap and Bp at 1-year post-surgery were statistically significant (p values of <0.001 and 0.001, respectively), which was similar to the effect of anterior vaginal mesh repair. Regarding those having total vaginal mesh repair, the corresponding POP-Q scoring for anterior and posterior wall and cervix (i.e. point Aa, Ba, Ap, Bp and C) demonstrated statistically significant change at 1-year post-surgery (all $p<0.001$), which reflected the effectiveness of total vaginal mesh repair for repairing both anterior and posterior POP.

Table 5 shows the results of postoperative changes in total vaginal length, genital hiatus, and perineal body. There was no significant shortening of vagina or lengthening of perineal body, but significant shortening of genital hiatus by 0.5 cm ($p = 0.001$). The shorter the parameters of genital hiatus, the less the chance of having a recurrence of prolapse. The preservation of vaginal length is important to maintain quality of sexual function postoperatively. The respective mean preoperative and postoperative vaginal length was 8.2 cm and 7.8 cm, with mean vaginal shortening of 0.4 cm ($p = 0.72$). This represented good preservation of vaginal length postoperatively.

In addition to comparison of the POP-Q scoring, the leading points of POP interpreted by stages are also commonly used for comparison of postoperative outcome. Usually the value of stage 2 or earlier vaginal vault prolapse / utero-vaginal prolapse postoperatively was used to define an objective cure of POP post-surgery. In this study, 51/54 (95%) women had stage 0 POP and 3/54 (6%) women had stage 2 POP at 1-year post-surgery. The overall mean improvement of POP-Q staging was 2.7 at 1-year post-surgery. Thus, according to the above definition, the objective cure rate was 100% for all 54 women.

The data were further stratified into three groups according to the type of mesh kit used (Prolift, Apogee /

Table 3. Details of intra-operative and postoperative complications

Complication	Overall (n = 65)	Vault prolapse (n = 47)	Utero-vaginal prolapse (n = 18)
Bowel injury	0	0	0
Bladder injury	0	0	0
Urinary tract infection	0	0	0
Mesh erosion	4	3	1
Buttock abscess	1	1	0
Chronic pelvic pain	0	0	0

Table 4. POP-Q scores of women undergoing anterior, posterior, or total vaginal mesh repair at 1-year follow-up

Point/landmark	No. of patients assessed	Mean preoperative POP-Q score	Mean POP-Q score at 1-year follow-up	Mean improvement	p Value
Anterior					
Aa	21	0.9	-2.8	-3.7	<0.001
Ba	21	1.1	-2.9	-4.0	<0.001
C	21	-3.6	-6.5	-2.9	0.001
gh	21	5.4	4.7	-0.7	0.004
pb	21	2.3	2.6	0.3	0.04
tvl	21	7.9	7.3	-0.6	0.15
Ap	21	-2.9	-2.7	0.2	0.21
Bp	21	-2.9	-2.7	0.2	0.21
D	3	-6.7	-7.7	-1.0	0.23
Posterior					
Aa	7	-2.6	-2.7	-0.1	0.36
Ba	7	-2.6	-2.7	-0.1	0.36
C	7	-5.7	-7.9	-2.2	0.04
gh	7	5.1	4.7	-0.4	0.48
pb	7	2.2	2.9	0.7	0.01
tvl	7	7.9	8.1	0.2	0.65
Ap	7	0.0	-2.9	-2.9	<0.001
Bp	7	0.0	-2.4	-2.4	0.001
D	7	-6.0	-8.5	-2.5	0.13
Total					
Aa	26	0.6	-2.3	-2.9	<0.001
Ba	26	1.6	-2.0	-3.6	<0.001
C	26	1.2	-5.7	-6.9	<0.001
gh	26	5.4	5.1	-0.3	0.43
pb	26	2.0	2.6	0.6	<0.001
tvl	26	8.5	8.1	-0.4	0.12
Ap	26	-0.3	-2.5	-2.2	<0.001
Bp	26	0.5	-2.1	-2.6	<0.001
D	3	-4.0	-4.0	0.0	1.00

Abbreviations: Aa, Ba = anterior compartment; Ap, Bp: posterior compartment; C = middle compartment; D = posterior vaginal fornix; gh = genital hiatus; pb = perineal body length; POP-Q = Pelvic Organ Prolapse–Quantification; tvl = total vaginal length

Table 5. Postoperative change in perineum and vaginal length

Point/landmark	No. of patients assessed	Mean preoperative POP-Q score	Mean POP-Q score at 1-year follow-up	Mean improvement	p Value
gh	54	5.4	4.9	-0.5	0.001
pb	54	2.1	2.7	0.5	0.80
tvl	54	8.2	7.8	-0.4	0.72

Abbreviations: gh = genital hiatus; pb = perineal body length; POP-Q = Pelvic Organ Prolapse–Quantification; tvl = total vaginal length

Perigee, and Dynamesh) and the respective preoperative and postoperative POP-Q scores were compared. No significant differences in all the POP-Q scores were found among these three mesh kit sets (Table 6).

Discussion

The usually quoted objective cure rate for POP in the literature is between 92.4% and 100%, and 97.6% at the 1-year postoperative period[15,16]. In this study, the objective cure rate for 54 women at 1-year post-surgery was 100%, according to the definition of the International Continence Society POP-Q scoring system[13]. However, it could be argued that the commonly used POP-Q scoring system is too crude to reveal the entire clinical picture and anatomical improvement postoperatively. This study provides this additional information by using individual mean POP-Q score improvement for the corresponding anatomical defect and measured the outcome on these scores postoperatively. The results of this study demonstrate the significant improvement in anterior and posterior vaginal compartment prolapse after anterior and posterior vaginal mesh repair, respectively. This cannot be shown if only the overall POP-Q score is used as it measures the leading point alone.

One of the main criticisms of use of the POP-Q score is the subjectivity of clinician assessment which may be a cause of bias. A literature report from the US addressed this argument specifically[16]. When comparing objective and 'eyeballing' measurement results in experienced hands, the POP-Q scores were highly associated[16]. In our study, we endeavoured to improve the objectivity of assessment by using a disposable ruler in the measurement of the individual POP-Q reference points in order to minimise bias.

Table 6. Significance of postoperative POP-Q scores among the three different mesh kit sets (Prolift, Apogee/Perigee, and Dynamesh)

Point/landmark for measurement	p Value
Aa	0.18
Ba	0.22
C	0.32
gh	0.09
pb	0.38
tvl	0.62
Ap	0.07
Bp	0.12
D	0.09

Abbreviations: Aa, Ba = anterior compartment; Ap, Bp: posterior compartment; C = middle compartment; D = posterior vaginal fornix; gh = genital hiatus; pb = perineal body length; POP-Q = Pelvic Organ Prolapse–Quantification; tvl = total vaginal length

The other important yet interesting finding in this study was the success in preservation of vaginal length postoperatively. This is important for sexual function and quality of life. In this study, the preoperative and postoperative total vaginal length was similar (8.2 cm vs. 7.8 cm) with no significant shortening ($p = 0.72$). This involved the technique involving avoidance of trimming of excessive vaginal skin, and preservation of vaginal tissue during wound closure. Appropriate insertion of the trocar has also been found to be important to avoid excessive shrinkage of mesh[17].

The mean hospital stay for the women in this study was 6.3 ± 2.2 days. This duration was longer than the usually quoted duration of hospital stay of around 4 to 5 days[18]. This finding could be explained by the extra postoperative observation during the early phase of vaginal mesh surgery development in our centre, extending the overall length of hospital stay in this study.

No intra-operative bladder or bowel injury was reported in this study. According to the literature, the bladder injury rate ranges from 0% to 4.26%[19-21]. Our low complication rate may be explained by the restriction of surgery to only a very experienced urogynaecologist in our unit, and strict control of operation quality by following the guided surgical procedure. There was one case of postoperative buttock abscess, with the patient presenting with fever and pain in the peri-anal area. The patient was effectively treated by incision and drainage and a course of antibiotic treatment. Mesh removal was not required. It could be argued as to whether removal of foreign body material from this patient was essential during infection. However, the rate of mesh removal after such surgery has been lowered by the design of type 1 polypropylene mesh, which allows macrophages to pass through and thus combat bacterial infection[22]. The final outcome for this patient was encouraging. There were no delayed complications seen in this study, such as chronic pelvic pain on further assessment.

The mesh erosion rate in our case series was 7.4% (4/54) and the re-operation rate for mesh erosion was 1.9% (1/54). The reported mesh erosion rate from Cochrane review was around 10% from 40 randomised controlled

trials[12]. Overall, the mesh erosion rate in our study was comparable with other international unit. Although we tried to minimise mesh erosion by double-layer vaginal closure, the evidence shows that this may not help in avoiding mesh erosion. One woman had mesh excision for symptomatic vaginal spotting. Other patients were asymptomatic and refused further surgical intervention.

No patient complained of chronic pelvic pain at 1-year post-operation. However, pelvic pain or dyspareunia has been reported in the literature after vaginal mesh surgery[23]. One of the possible explanations for absence of pelvic pain in our series is the adjustment of mesh size before insertion. As we found that the female pelvic floor area is variable in different patients but that the vaginal mesh only comes in a standard size, we cut the mesh according to the size of the pelvic floor area of individual patients to avoid excess implant material being introduced. The excess foreign body material may lead to extensive scarring and contracture and hence chronic pelvic pain. However, as the sample size is small in this case series, further study in this area is encouraged to provide more information on this modified aspect of vaginal mesh surgery.

Furthermore, the data from this study demonstrated the importance of precise and concise preoperative counselling before vaginal mesh surgery. The risk of mesh erosion is important to discuss in detail with the patient before surgery to avoid the possibility of medico-legal consequences; one of the patients in this study required re-operation for symptomatic mesh erosion. Although there was no reported intra-operative bowel or bladder injury in this study, it is also recommended to discuss these potential risks in detail, as consequences such as a stoma or prolonged catheterisation may not be anticipated by a patient having vaginal mesh surgery for POP.

Although different mesh kits were used in this study due to the supply limitations in the publicly funded hospital setting, the overall design of the mesh kits and anatomical placement of the mesh were very similar. There was also no significant difference demonstrated on the postoperative POP-Q score when comparing the three different groups of patients using the respective mesh kit sets (Prolift, Apogee / Perigee, Dynamesh).

The limitation of this study was the absence of subjective assessment and quality of life assessment, as there were no data available from the case records. The suggested solution is to perform a prospective study in future, including assessment on subjective improvement of symptoms and quality of life assessment using a validated questionnaire. Furthermore, the long-term success rate of POP repair is important to determine the efficacy of this treatment option. Prospective follow-up assessment of patients is essential to provide further information in this area.

In conclusion, in comparison to most reports in the literature, this study provides stratified POP-Q score data for women having vaginal mesh repair for POP. This can help to illustrate the true anatomical improvement after specific types of vaginal mesh repair, rather than simply a comment of objective cure when the POP-Q score is used alone. Furthermore, this case series supports the view that stringent surgeon training and selection may help to reduce commonly reported intra-operative bladder and rectal injuries. However, the long-term results following vaginal mesh repair for POP for the patients in this study are still awaited.

Declaration

No conflicts of interest were declared by the authors.

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